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Cephalothrix, *Drepanophorus*) that they pass through three principal stages.

I. A bilateral Gastrula-form.

II. A Gastrula, with the middle layer (mesoderm) arising from the exoderm, and composed of two principal rudiments: (1) the muscular layer, thin and uniform; (2) the recticulum, extending through the entire body-cavity, and represented in the embryos of *Lineus obscurus* by oil globules.

III. The longitudinal layer is enlarged in advance of the lateral organs into a solid mass; the nervous system arises over all the internal extent of the layer thus complicated. The internal cavity is divided into a system of cavities separated by partitions, all along which the reticulum is applied in a continuous layer.

These three states, which may be successively observed in the embryo of a nemertean worm, appear to exist in a more explicit way in Prorhynchus, where state II seems to be represented by an adult, free-living Planarian. The Nemerteans, then, appear to have derived from a sudden modification of the Planarian type, and justify, in the author's opinion, the establishment of homologies between the two groups.

THOMAS' NOXIOUS INSECTS OF ILLINOIS[1].—This interesting report is divided into two parts, the first relating to horticultural entomology, and the second comprising the introductions to and first part of a manual of economic entomology for the State of Illinois, including the Coleoptera. The first part contains excellent advice concerning the best means of contending against insects injurious to the orchard, especially general and preventive remedies, which are always the best and usually the last to be applied. Considerable attention is bestowed on the birds found to be useful in the orchard, and a list is given of the most important species. The report will prove very useful and timely to the farmers and gardeners of Illinois, for whose sole use it has been compiled.

CONTRIBUTIONS TO THE FOSSIL FLORA OF THE WESTERN TERRITORIES. PART II. THE TERTIARY FLORA. BY L. LESQUEREUX.[2]—In this important work Prof. Lesquereux gives to the world the results of many years of laborious investigation of the remains of plants which have been discovered in the later horizons of the Rocky Mountain region from the Laramie formation upwards, by the U. S. Geological Survey under Dr. Hayden, and by Messrs. Berthoud, Le Conte, Denton and Allen, Profs. Lakes and Cope, Lieut. Vogdes and others. After considering the stratigraphy of the lower lignitic formations of New Mexico, Colorado and Wyoming, which he with others regards as of undoubtedly cretaceous age, he proceeds to describe that of the true "lignitic," or as it will now be called, the Laramie formation. The descriptions refer chiefly to the exposures which the author has visited along the line of the Union Pacific railroad, and but little information is furnished respecting the strata of the Laramie on the middle and upper Missouri and the Saskatchewan regions. Then follow the detailed descriptions of three hundred and twenty-nine species of plants, many of which are represented by numerous remains, and from various localities. This portion of the work is illustrated by sixty-five plates, well executed by T. Sinclair & Son, of Philadelphia. Here the author supplies his fellow students with the most valuable evidence as to the characters presented by this vast department of life during the past periods of the existence of our continent.

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[1] *Sixth Report of the State Entomologist on the noxious and beneficial Insects of the State of Illinois.* The first biennial Report. By CYRUS THOMAS, PH.D., State Entomologist. Springfield, Ill., 18 7, 8°, pp. 174, iv, ii.

[2] *Report of the United States Geological Survey of the Territories.* F. V. HAYDEN, U. S. Geologist-in-charge. Vol. vii. 4to, pp. 366. 1878.

The work closes by a general discussion of the meaning of the evidence with regard to the mutual relations in time of the various formations treated of, and their correspondences to the horizons of other countries. He reaffirms the conclusions previously stated, viz: that the floræ from the base of the Laramie upwards is of tertiary age. He divides the series into four groups, all of which (p. 352) he regards as belonging to the "Lignitic formation." He thus parallelizes them with the European standards (p. 354). "I admit the lower group as Lower Eocene; the second group, which seems intermediate between this and the Carbon, may be Upper Eocene; the relation of the third group is by its plants with Lower and Middle Miocene of Europe, and that of the fourth with the Upper [Miocene]. These are like the first outlines traced for the preparation of a map; they may be erased or modified, the spaces have to be filled as our acquaintance with the Tertiary becomes more intimate."

The evidence in favor of the correctness of these positions is rather more abundant than that derivable from the animal remains, and is handled with care in Prof. Lesquereux's discussion. There is no reason why his conclusions should not be accepted by students in other departments. Nevertheless the value of the evidence derivable from these vegetable remains is only to be fully understood by comparison with that derived from all other sources.

As a student for the last ten years of the vertebrate remains obtained from these formations, I have to say, as heretofore, that the evidence they offer as to the age of the horizons both in their mutual relations and their relations to the formations of other countries, is quite different from that presented by Prof. Lesquereux. It is well known that I was the first to show that the vertebrate fauna entombed in the lignitic formations to the summit of the Laramie, or to the summit of Prof. Lesquereux's first division, and perhaps his second division, is of mesozoic and cretaceous type; and also that that of the Wasatch (or Green river) epoch, or Prof. Lesquereux's fourth group, lower division, is of Eocene Tertiary age. The evidence in favor of these positions has been steadily accumulating since I first announced them in 1869 and 1872, no exceptions have come under my notice, and their applicability has been extended to all parts of the North American continent which have yet been explored. In fact the most important interruption in the vertebrate life of North America is found between the Laramie and Wasatch epochs, and there only can the line between the Cretaceous and Tertiary periods of this continent be drawn.

The evidence in favor of this position has been in a measure overlooked by Prof. Lesquereux. He remarks (p. 30): "As no kind of cretaceous animal remains have been discovered in the Lignite of Colorado, none either in that of the north, generally called the Fort Union group, the question of age essentially bears upon that Bitter Creek series. The line of demarkation between the cretaceous and the tertiary is placed by Prof. Cope above the Black Buttes Saurian Bed." The facts as regards the amount of vertebrate evidence in favor of the cretaceous age of the Laramie, are as follows: In 1869 I determined the vertebrate remains from the Fort Union beds of Dakota, which had been supposed to be mammalian, to be reptilian, and indicative of the Mesozoic character of the Fort Union beds of the Missouri. The number of species furnished by this region is seven. In 1872 I obtained the *Agathaumas sylvestre* from the leaf-beds at Black Butte station in the coal region of Wyoming, and made the determination of its Dinosaurian character to which Prof. Lesquereux alludes. In 1872 I collected, in the Laramie formation of Colorado, nine species of vertebrates of the same genera, and sometimes species, as those previously determined from Dakota. In 1875 I determined the same genera and in some instances the same species from specimens sent by Dr. Dawson from the Saskatchewan. This collection included nine species. In 1876 I made an exploration of the Judith River basin in Montana, and obtained a large collection of vertebrate remains, embracing forty-eight species. These I showed to be of the same general character as the species already obtained from the localities previously mentioned, having a predominatingly cretaceous type, and close affinities and sometimes identity with those I had previously described. The vertebrate species now known from the Laramie formation are sixty-three, enough to determine clearly its position in the series; and study has shown it to be of uniform character over the entire continent north of New Mexico, and of general cretaceous type. Prof. Lesquereux seeks to explain the presence of the Dinosaurian *Agathaumas sylvestre* in a bed of Tertiary plants as did Prof.

See Bulletin U. S. Geological Survey Territories. III, No. 3, 1877.

Dawson, and has apparently not noticed my reply to the remarks of the latter gentleman. He observes (p. 351): "We may admit, however, that while the Tertiary age was at its beginning represented as a land formation as seen by its flora, a cretaceous marine fauna may have still locally persisted in deep seas. Facts of this kind are recorded in the European geology. The presence of the saurian *Agathaumas* in the lignite bed of Black Buttes is then certainly explainable as denoting the wandering of that animal out of its domain, and its death by penetrating into a peat bog and being irretrievably swallowed up by its soft matter."

Now it does not seem to be as well known as it should be that no such thing as a marine Dinosaurian has yet been discovered, and that the numerous *Vertebrata* of the Laramie formation are as generally terrestrial or, (in the case of the fishes) fresh-water in their character, as are the plants described in his valuable report now under review. I may here note the fact that Maj. J. W. Powell, who has followed Dr. Hayden in regarding the Wasatch epoch as of Tertiary age, was disposed at one time to place its inferior boundary below the *Agathaumas* bed, so excluding the latter from the cretaceous series. Last season's examination of the locality at Black Butte, by Prof. C. A. White, has convinced that gentleman that the boundary between the cretaceous and Tertiary formation is where I placed it, above the *Agathaumas* bed.

As regards the Lower Eocene character of the Wasatch beds, I have furnished abundant and conclusive evidence in various publications, which are summarized in the Vol. IV, of the Final quarto reports of Lt. Geo. M. Wheeler, published in 1877. This period witnessed the introduction of the Mammalian fauna in large numbers to North America, and forms the beginning of Tertiary time. Prof. Lesquereux's conclusion that it is of Miocene age, is negatived by the *Vertebrata*, which are typically lower Eocene. We must conclude then that not only was a Cretaceous fauna contemporary with a Tertiary flora in North America, but that the flora spans the greatest gap in the history of vetebrate life. We must also believe from the evidence offered by Prof. Lesquereux, that a Miocene flora was contemporaneous with an Eocene fauna. Since a Jurassic flora is still, according to Dr. Hector, existing in New Zealand, it must be evident that the positions of strata in the scale will be far more accurately determined by a consideration of the *Vertebrata*, than of any other form of life.—*E. D. Cope.*

RECENT BOOKS AND PAMPHLETS.—National Academy of Sciences. Biographical Memoirs. Vol. 1. Washington. 1877. 8vo, pp. 343.

Proceedings of the National Academy. Vol. 1. Washington. 1877. 8vo, pp. 119.

Sponges considered as a distinct sub-kingdom of animals. By A. Hyatt. (From the Proceedings of the Boston Society of Natural History, Vol. xix, Nov. 1, 1876.) 8vo, pp. 5.

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